REMARKS

Claims 1-5, 7-15, and 17-21 are pending and at issue. These claims were previously rejected based on a suggested combination of documents to Campbell and Chilimbi. On March 19, 2007, applicant filed a request for continued examination along with an amendment to the claims. The examiner removed that prior rejection, but now rejects the claims under a new rejection based on a patent to Andreasson. Applicant appreciates the examiner's attention to this case and, in particular, the reconsideration of the prior rejection. Applicant, however, respectfully traverses the new rejection. Andreasson appears to be further away from the mark than the previous rejection, but either way Andreasson does not teach or suggest the recited subject matter.

While the shortcomings in Andreasson are numerous, one casts a shadow over the entire office action: Andreasson does not teach or suggest identifying delinquent regions in a memory heap and executing a garbage collection routine over these delinquent regions.

As the title suggests, Andreasson is directed to a reinforcement learning technique for garbage collection, where a reward/penalty value is calculated and used to assess whether to perform a garbage collection, and what kind of collection to perform. Thus Andreasson is prospectively driven, designed to assess the effects of performing a particular type of garbage collection and use that assessment to guide future garbage collection decisions. Instead of looking to the effects of garbage collection, however, the present application describes techniques that focus on identifying a triggering event for and performing a garbage collection in response to that triggering event. Claim 1, for example, is generally directed to first identifying delinquent regions in a memory heap and then applying a garbage collection technique to those delinquent regions.

The "reinforcement learning" decision process of Andreasson is specified by "rewards and penalties that indirectly tell the [reinforcement learning system] agent what it is supposed to do." Abstract. Sifting through the morass of Andreasson's narrative prose, one finds discussions of various garbage collection control techniques—e.g., reference counting collectors, mark-and-sweep tracing collectors, stop-and copy collectors, mark-and-compact collectors, generational collectors, incremental collectors, concurrent collectors, parallel

collectors, and mostly-concurrent garbage collection. See, e.g., Adreasson 9:41 – 14:8. But one finds no discussions of identifying a delinquent memory region and initiating garbage collection in a region identified as delinquent. The office action points to descriptions of Figure 6 which depicts a generic "decision process" for the reinforcement learning system. But, these descriptions do not discuss identifying a delinquent memory region and initiating garbage collection in that region.

The only citation offered by the office action as teaching an identification of "delinquent regions" is the discussion spanning columns 19 and 20 and pertaining to using the amount of fragmentation of a volume to affect garbage collection. There is nothing, of course, in Andreasson that links this fragmentation determination to identifying a memory region that is delinquent. Fragmentation is a touchstone for garbage collection and Andreasson's use of fragmentation would appear to be no different from that otherwise known in the art. Of course, it can be important to keep track of how much memory is available in a heap, as Andreasson discusses in column 20, but the office action points to nothing in Addreasson that discusses identifying a memory region as delinquent, nor performing garbage collection over that delinquent region. Fragmentation does not inherently mean that a region is delinquent, as fragmentation often occurs during normal memory heap operation and thread allocation. As the examiner is undoubtedly aware, for a teaching to be argued as inherent, that teaching must necessarily be present in the single prior art disclosure. *See, e.g., Electro Medical Systems, S.A. v. Cooper Life Sciences, Inc.*, 34 F.3d 1048 (Fed. Cir. 1994). Courts do not allow inherency challenges based on mere possibility or conjecture. "The mere fact that a certain thing may result from a given set of circumstances is insufficient to prove anticipation." *Electro Medical Systems, S.A., v. Cooper Life Sciences, Inc.*, 34 F.3d 1048, 1052 (Fed. Cir. 1994). Here, the examiner points to nothing even suggesting that a fragmented region is a delinquent one.

The deficiencies of Andreasson regarding delinquency are even further apparent when one looks to the rejection of claim 3. Claim 3 recites various kinds of performance data that the system may measure to identifying when a memory region becomes delinquent. Such delinquency may result from cache misses, translation lookaside buffer misses, branch mis-predicts, stalls due to data dependency, and data cache write-back.

Andreasson discusses fragmentation, but as the office action recognizes, the reference does not discuss any of these claimed performance data. (That's because Andreasson is not directed to identifying delinquent region, by the way.) Yet, the office action takes official notice that because such metrics were "well know indicators of performance" then they would have been obvious to apply in Andreasson. Applicant respectfully traverses the official notice.

First, applicant notes that the office action provides no support for its (necessary) position that it would have been obvious to modify Andreasson to include measuring such performance data. The position appears to be an impermissible *ex post* reasoning that the claimed subject matter must have been in the general knowledge of the art. There is certainly no showing that the asserted statement is "capable of such instant and unquestionable demonstration as to defy dispute," as required by the MPEP. *See*, MPEP §2144.03(A). Whether the measurement of such performance data was known is not the issue, the issue is whether it would have been obvious to modify Andreasson to come up with the claimed subject matter. Documentary support is hereby requested, if the notice is to be maintained.

Second, there is nothing to suggest that one would have been motivated to modify Andreasson to include the identification of a delinquent region, much less measuring any of the outlined performance data as part of that determination. Indeed, Andreasson states that its system is to "**only** optimize its behavior according to the objectives specified through the reward function." Andreasson 19:57-61, cited by the office action (emphasis added). Even if, as *KSR v. Teleflex* discusses, there is no need to look to whether the modification would have been obvious to the patentee, the examiner must still show that it would have been obvious to the person of ordinary skill in the art. Here, the examiner does not even identify a problem to be solved by including such performance data measurements into Andreasson. Absent, some teaching, inference, creative step, etc. from the art, there is nothing that suggests that one would have been motivated to modify Andreasson as the way suggested. In fact, as a prospective looking system that tries to offer a new way of assessing the effects of a garbage collection, not the trigger, applicant respectfully but strongly asserts there would be no such rationale found for the suggested modification.

Claims 1, 14, and 19 recite:

1. An article comprising a machine-accessible medium having stored thereon instructions that, when executed by a machine, cause the machine to:

obtain, from a performance monitor, performance data for a memory heap having a plurality of memory regions;

based on the performance data, determine if at least one of the plurality memory regions is a delinquent region; and

in response to a determination that at least one of the plurality of memory regions is a delinquent region, execute a memory management routine to optimize that region of the memory heap by executing a garbage collection routine on at least one delinquent region, the garbage collection routine re-arranging the plurality of memory regions stored in the memory heap to optimize the memory heap.

14. A method comprising:

within a central processor for a machine, identifying load miss memory addresses from a memory heap including a plurality of memory regions;

maintaining a frequency count for the identified load miss memory addresses;

determining if any of the plurality of memory regions include a threshold value of load miss memory addresses; and

optimizing the memory heap in response to a determination that at least one of the plurality of memory regions includes a threshold value of load miss memory addresses, wherein optimizing the memory heap comprise performing a garbage collection on at least one of the memory regions including the threshold value of load miss memory addresses.

19. A system comprising:

hardware to monitor performance of a memory heap and to compile performance data on memory regions within the memory heap, wherein the hardware is able to determine if any of the memory regions are delinquent regions based on the compiled performance data and wherein the hardware has a memory manager for optimizing the delinquent regions by re-

arranging memory regions in the memory heap in response to a determination of at least one delinquent member region; and

a memory manager for optimizing the delinquent regions.

For at least the foregoing reasons outlining distinctions between the present application and Andreasson, the rejections of each of these independent claims are traversed.

In view of the above amendment, applicant believes the pending claims 1-5, 7-15, and 17-21 are in condition for allowance.

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Respectfully submitted,

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